Distr.
LIMITED

UNIDO/IB.463
24 April 1984

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

ENGLISH

THE UNIDO DATA BASE: PRIMARY SOURCES AND DATA BASE DESIGN*

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Summary

The following note provides an overview of the data base for industrial statistics which was developed and is maintained by the Statistics and Survey Unit, Division for Industrial Studies, UNIDO. Section A describes the orientation and approaches adopted by the Unit in carrying out this project. Two important aspects should be noted. First, UNIDO is primarily a user (rather than a producer) of industrial statistics and the construction and operation of the data base reflect this orientation. Second, the data base is primarily intended to meet the statistical needs of researchers engaged in international, or cross-country, studies rather than country-specific investigations. Accordingly, UNIDO statisticians give priority to the development of a set of international statistics which meets acceptable standards of consistency and comparability in terms of the statistical definitions and concepts used in compiling the country data.

With regard to the contents of the data base, information for 144 countries is included. The time series for each country is an annual one spanning the period 1963 to latest year (generally 1981). Data have been collected for five fields: value added, gross output, employment, wages and salaries and production indices. For each country, year and field, this information has been compiled for up to 28 industries in the manufacturing sector.[1/] The coverage for 60 countries is regarded as complete, meaning that statistics are generally available for all years, for each of the five data fields and for the 28 industries within manufacturing.

Section B describes the characteristics of the primary data received by UNIDO. The discussion highlights those aspects which are of

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1/ Data for some countries are partial and complete information is not available for every country and year. For further details, see section A.

major concern to users conducting cross-country studies. These include different national practices with regard to the definition of the manufacturing sector, the definition of the industries included in the sector, variations in concepts of valuation and measurement and the extent of non-reporting and non-response. Section C summarizes the approaches of UNIDO statisticians in dealing with each of these problems. It also describes the priorities assigned to the various sources of supplementary data (e.g. UNIDO field work, national and international sources) that may be relevant in dealing with the problems mentioned above.

The structure of the UNIDO data base is outlined in Section D. After receipt of the data by UNIDO, the information passes through several stages, all contained within the data base. At each stage, the data is evaluated and analyzed in relation to specific sources of supplementary information - namely national industrial censuses and surveys, UNIDO field work, input-output tables (stage II) and data compiled by a number of other international and regional organizations (stage III). Similarly, the methods of adjustment and estimation carried out in later stages (e.g. IV) are dependent on the results achieved in preceding stages. Finally, annex A provides a bibliography of national publications which, to date, have been utilized to supplement, extend or otherwise adjust the original statistics in order to develop a consistent and comparable set of international statistics on industry. Annex B gives a brief description of the 28 industries included in the manufacturing sector.

Copies of the UNIDO data base may be purchased by users outside the United Nations system. The charge for these data, which is provided in machine-readable form, is $500. Further details may be obtained from the Statistics and Survey Unit, Division for Industrial Studies, UNIDO, P.O. Box 300, A-1400 Vienna, Austria.

A. Orientation and Priorities

The UNIDO data base was established in 1977. At that time, the single supplier was the United Nations Statistical Office (UNSO). The data received by UNIDO were the equivalent to that published annually by the United Nations in the Yearbook of Industrial Statistics, volume I. During this initial phase, UNIDO statisticians gave priority to extending the coverage and detail of the published data. Gradually, additional suppliers of industrial data - including national sources as well as data compiled by the World Bank, OECD, United Nations regional commissions and EUROSTAT - were incorporated in the data base.

The subsequent experience gained in servicing users within UNIDO showed that most requests concerned only a few of the various types of data (or fields) collected by UNSO and appearing in the Yearbook of Industrial Statistics. These included: value added, gross output, wages and salaries (all expressed at current prices in national currency units), employment and production indexes. Accordingly, further statistical work in UNIDO focused on these five fields, all of which were entered in an on-line system.

The experience accumulated during the development phase also indicated the need to set some priorities that reflected user needs. UNIDO research is predominantly concerned with international (or cross-country) types of analyses; a smaller number of its studies are country-specific. A major problem in servicing the former type of studies is that the data reported to UNSO by national statistical offices vary widely in terms of coverage, concepts and definitions (discussed below).

In judging departures from international standards, UNSO follows the International Recommendations for Industrial Statistics and the concepts and definitions developed in connection with the International Standard Industrial

Classification (ISIC).[1/] The approach, as stated by UNSO, is as follows: "Deviations from these standards, where known, are mentioned in the introductory note to each country chapter or in the footnotes to each table."[2/] In other words, UNSO indicates discrepancies but does not adjust or correct them.

Owing to the condition of the data, a large portion of UNIDO's research effort was frequently devoted to preparatory statistical work.[3/] Extensive discussions between UNIDO and researchers in private institutions and universities led to the conclusion that they, too, faced similar problems. Thus, a major responsibility of UNIDO statisticians has been - and continues to be - the development of a data base which meets acceptable international standards for comparability and consistency.

Finally, with regard to the contents of the data base,[4/] data for 144 countries are included. The maximum time series for each country is from 1963 to the latest year (in general, 1981). Statistics on each of the five data fields are compiled according to the ISIC and are reported at the 3-digit level of that classification. Thus, the maximum number of observations would be 383,000 assuming full reporting for each country/year/field and for each of

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1/ For a description of these concepts, see International Recommendations for Industrial Statistics (United Nations publication: sales no. E.83.XVII.8) and International Standard Industrial Classification of All Economic Activities (United Nations publication: sales no. E.68.XVII.8)

2/ Yearbook of Industrial Statistics, vol. I, 1980 edition (United Nations publication: sales no. E.82.XVII.11), p.ix.

3/ Such operations entailed data screening, estimations, adjustments, etc. designed to ensure that the international statistics being used were roughly comparable and consistent in terms of definitions, concepts and scope of measurement.

4/ The contents of the UNIDO data base have been documented in detail. See, UNIDO, An Inventory of Industrial Statistics in the UNIDO Data Base, (UNIDO/IS.385, May 1983). Although that inventory does not represent the most recent status of the data, it provides a clear picture of the scope and coverage.

the 28 industries in the manufacturing sector.[1/] In reality, a total of 213,000 observations are currently contained in the data base.

B. Major Weaknesses of the Primary Data

For purposes of cross-country studies, the major problems encountered by UNIDO in using the data in their original form were the following:

(i) National differences in coverage by size of establishment. Most reporting countries exclude some portion of small-scale industry from the data provided to UNSO.[2/] Moreover, the definitions employed vary widely. For instance, one country may exclude information on establishments with less than 5 employees while another may ignore data for establishments with less than 50 employees. The problem has a second dimension: a national office may alter the scope of its collection exercise, as defined by size of establishment, in different years. In years when an industrial census is carried out, small scale establishments may be included but will be ignored in non-census years when a survey, using a reduced sample, is employed.

(ii) Departures from the ISIC classification. National classifications may not conform to the present version of the ISIC. Although the national office generally makes efforts to convert the data to the ISIC prior to submitting it to UNSO, discrepancies may remain. This often results in the reporting of an aggregate, i.e. a combination, for two or more industries, where an 'industry' is defined to be

1/ This maximum is calculated as follows: 144 (countries) x 19 (years) x 5 (data fields) x 28 (industries) = 383,040.

2/ This discrepancy often results from the fact that small-scale industry is outside the purview of the Ministry of Industry. Moreover, the legal framework governing the collection of data may arbitrarily exclude establishments below a given size - defined in terms of their work force or according to level of investment.

equivalent to the 3-digit level of the ISIC.[1/] A total of 28 industries are included in the manufacturing sector (ISIC 3) and the types of combinations varies both among countries and over time. An indication of the magnitude of this problem is suggested by the fact that in the primary data received by UNIDO the number of combinations exceeded 20 per cent of all observations.[2/]

(iii) National differences in definitions and concepts. In the original data at least two major differences in national statistical practices pose problems to the user. First, valuation may be at factor costs or producers' prices, depending on the treatment of indirect taxes and subsidies. Second, employment data may refer to the number of persons engaged or the number of employees.[3/] Either type of inconsistency will be significant for cross-country studies of specific industries. For example, the treatment of indirect taxes and subsidies will be particularly important in the case of industries such as beverages, tobacco, refining or steel. Inconsistencies in the definition of employment (as well as derived indicators relating to productivity) are especially apparent in employment-related studies of textiles, clothing and other industries where small-scale establishments and cottage industries are important.

1/ For example, data for textiles (ISIC 321) and clothing (ISIC 322) are sometimes combined and reported as one 'industry'. For a description of the ISIC classification, see annex B.

2/ Some combinations involve more than two industries. If all these combined observations were reported as single ISICs or unique observations, the total would exceed 35,000 observations.

3/ Persons engaged are defined as the total number who worked in the establishment during the reference year. The number of employees excludes working proprietors, active business partners and unpaid family workers - all of which are included in the number of persons engaged.

(iv) Non-reporting, either for individual branches or for the entire sector. Countries often base their replies to the UN questionnaire on the results of an annual survey. In a few cases, these surveys concern only selected manufacturing industries. For instance, in the case of Mexico, data for employment and wages and salaries cover only 58 out of 225 industrial groups in the national classification.[1/] Similarly, the annual industrial survey in Indonesia does not include petroleum manufacturing activities (ISIC 353 and 354).[2/] Finally, a few countries do not submit data to UNSO on a regular (i.e. annual) basis.

(v) The failure of national offices to adjust for non-response. The need to adjust for non-response is a problem encountered in any statistical survey or census. Although the majority of countries carry out such adjustments, this is not always the case. The failure to take account of non-response may be due to a lack of sufficient information, insufficient staff to carry out this task or any number of other explanations. The extent to which this factor will distort the census or survey results varies depending upon the industry in question and the type of data (output, employment, wages, etc.) being examined.

1/ See Yearbook of Industrial Statistics....., p. 357.

2/ Ibid., p. 241.

C. UNIDO Treatment of Major Weaknesses in the Data

Of the problem areas listed above, (iv) and (v) are, perhaps, the most difficult to redress. In contrast, problems (ii) and (iii) are sometimes solvable, provided that sufficient supplementary data (from both national and international sources) are available and that users are prepared to accept a reasonably modest set of assumptions employed to carry out adjustments. Finally, problem (i) - the need to account for national differences in coverage - may be addressed in at least a limited number of cases. The following discussion does not focus on the actual methods[1/] employed to deal with each of these problems but, rather, on the approaches and sources of information considered.

(i) National differences in coverage by size of establishment. The most significant inconsistencies in the data presumably arise when countries employ a 'cut-off point' that omits those establishments with less than 20, 30 or even 50 employees. The demarcation point may also vary depending upon the type of data being collected.[2/] In addressing this problem, UNIDO chose, as a desired standard, coverage of all manufacturing

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1/ For a discussion of the methods used by UNIDO in the adjustment and development of data on production indices, see Industrial Statistics for Research Purposes, Methodologies and a Data Inventory of Production Indexes (UNIDO/IS.309, 1982). A complete description of UNIDO methods employed in connection with the general industrial statistics (i.e. value added, gross output, employment and wages and salaries) in the data base will be published in 1984.

2/ For instance, Mexican data for gross output and value added refers to all establishments although the statistics on employment and wages and salaries concern only a limited portion of the manufacturing sector. See Yearbook of Industrial Statistics....., p. 357.

establishments with five or more employees.[1/] Information on small scale industry (e.g. establishments having 5 to 10 employees, 5 to 20 employees or 5 to 50 employees) can sometimes be obtained from national sources - mainly industrial censuses and special surveys of small-scale industry. These publications provide details on value added, wages, employment, etc. broken down both by size of establishment and by industry. A drawback is that such information is available only for selected years. However, relative to the contribution of medium and large scale establishments, the importance of small-scale enterprises (whether measured in terms of total manufacturing, employment, output or wages) is not likely to shift drastically in a period of five years, for instance. Thus, where such information can be obtained, it provides a possible means for adjustment which is based on data for the country in question.

There will always be countries where no such data are available and adjustments can not be carried out. For all countries, UNIDO has compiled an annual inventory showing variations in the definition of the cutoff point for each type of data, along with information concerning the adjustments made by statisticians.

(ii) Departures from the ISIC Classification. The most frequent violation of the ISIC classification concerns the practice of combined reporting, i.e. data for two or more industries are reported as an aggregate. Such

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1/ In carrying out this work, no attempt was made to adjust the data for countries where coverage of the manufacturing sector extends to all establishments or to those with less than five employees.

combinations may occur in any of the five data fields with which UNIDO is concerned. Furthermore, the combinations may be different depending on the data in question and they may change from year to year. Clearly, widespread violations of the ISIC classification can pose serious problems for users attempting to study one or more specific industries. The problem becomes more acute when researchers have need for more than one field of data (e.g. an analysis of productivity which would require the matching of data on output and employment) since the combination of industries is not necessarily the same for different fields.

UNIDO's collection of national censuses, surveys and input-output tables (described above) is an obvious source of additional information to rectify some of these classificational discrepancies. Often these publications provide statistics which are far more detailed then those published in the Yearbook of Industrial Statistics. Other sources (both published and unpublished) include the World Bank, OECD, EUROSTAT, ILO, FAO and data compiled by United Nations regional commissions. Industry-specific data such as that collected by the International Iron and Steel Institute is also helpful. All this information is utilized by UNIDO statisticians in their efforts to reconcile the primary data with the ISIC.

(iii) National differences in concepts and definitions. Supplementary information which may be used to convert from producers' prices to factor costs or from number of persons engaged to number of employees is not readily available. The concepts used when carrying out an industrial census or survey are generally the same as those employed when reporting to UNSO. Consequently, UNIDO's work to date has gone no further than to document - in the data base - the various concepts

and definitions employed by each country throughout the available time period. Some possibilities to account for differences in conceptual practices may be available, however. For instance, a limited number of countries simultaneously report according to two definitions (e.g. persons engaged and employees). If information for a number of countries can be compiled, a comparison of the variation between corresponding sets of data may provide the basis for ad hoc conversion factors to be used. Information on indirect taxes and subsidies, available from national accounts data as well as national censuses may also provide a means of accounting for differences in conceptual practices.

(iv) Non-reporting. In some instances, countries report no data whatsoever for one or more years. UNIDO statisticians conduct a search for data from international sources and the field reports of experts to include observations for missing years. If the search is not successful, statisticians may make estimates provided that no more than two years are missing and the time series is otherwise complete. Where non-reporting concerns only specific industries or fields of data, a similar search of appropriate sources is carried out. If available data are known to cover only part of an industry and no supplementary information can be located, the observations are deleted from the data base.

(v) Non-response. Very little information is available to international statisticians to deal with this problem. UNSO provides some insights into the scope of the problem by indicating, in the country notes of the Yearbook of Industrial Statistics, the extent to which countries have

adjusted for non-response. Future work will include a file developed by UNIDO which documents those cases where response ratios are known to be low.

D. Structure of the UNIDO Data Base

In line with the research priorities outlined earlier in this paper and based on the experience accumulated in the previous seven years of operation, UNIDO redesigned its data base in 1984. At present, the new design incorporates four distinct and separately identifiable stages.[1/] All data pass through each of these stages and, at each stage, are subject to various forms of examination and/or adjustment. The purpose of the new structure is twofold. First, the layout facilitates the organization of the work of UNIDO statisticians - both with regard to statistical methods and data sources. A 'stages approach' serves to impose a hierarchical set of priorities on the work of statisticians with regard to the sources which they utilize and, indirectly, the statistical methods they employ. As explained below, information from national sources (published and unpublished) receives a higher priority than similar data supplied by international sources. Accordingly, different sources for data modification are associated with each stage in the data base. Second, the stages approach lends itself to more extensive use of the computer for data screening, analysis, editing, etc. This is a natural consequence of the fact that development of the data base is now broken down into a series of specially defined tasks which are carried out

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1/ Additional stages may be added at a later date. The incorporation of later stages is contingent on the successful development of standardized methods of estimation, using both time series and cross section approaches, to deal with outstanding types of inconsistencies which remain in the data base after completion of stage IV.

in a pre-determined sequence. The following discussion summarizes the priorities imposed on information sources and data analysis in terms of the stages in the UNIDO data base.

Stage I - Responses to national questionnaires compiled by UNSO. At this stage the data is a duplicate, in machine-readable form, of that provided to UNIDO by UNSO. Information has been compiled from replies to questionnaires sent by UNSO to national offices. Prior to its receipt by UNIDO, the data has already been subject to a certain amount of screening by UNSO to determine consistency and accuracy. Upon completion of this exercise, UNSO publishes the results annually in the Yearbook of Industrial Statistics - Volume I, General Industrial Statistics. Consequently, the condition of the data already reflects the results of considerable work - carried out by UNSO - to identify and to document any known departures from the International Recommendations for Industrial Statistics.

Stage II - The incorporation of national data. Work begins by drawing upon UNIDO's collection of national statistical publications. These consist of industrial censuses, surveys and a smaller number of input-output tables. Statisticians compare the information in the national publication with that communicated to UNSO for the corresponding year(s). In doing so, they rely heavily on the earlier work of UNSO to identify and document departures from the ISIC. In many instances the two sets of data are identical. However, an international publication such as the Yearbook of Industrial Statistics must, inevitably, exclude a certain amount of data - as well as information about the data (META data). Such information is extremely useful to statisticians

whose mandate is to take account of - rather than to document - significant departures from the international classification. Examples would include the following:

(a) The reconciliation of discrepancies previously noted by UNSO: National publications frequently provide useful details regarding output and employment by size of establishment. They may contain a more extensive disaggregation of activities than the 3-digit level of the ISIC. Where the national classification differs from the ISIC, additional description is usually available in national publications. This and other information is of great use in cleaning or otherwise adjusting the data to meet the desired definitions and concepts.

(b) The inclusion of final, rather than preliminary results: The national statistics supplied to UNSO are sometimes based on provisional data, e.g. the preliminary results of an annual survey or census. Subsequent publication of the final results by the national office may alter the original figures or may provide more statistical detail and related information than was previously available to UNSO. Here, the work of UNIDO statisticians consists mainly of updates or revisions but may also include the elimination of various discrepancies noted in connection with the ISIC.

(c) The incorporation of data from additional national sources: A number of producers of industrial data may exist in any country. For instance, one institute may compile detailed production indices for the manufacturing sector while another is concerned with data on

employment or salaries. In addition to national statistical offices, central banks, national planning institutes, ministries of labour, etc. may all compile official statistics and issue them at different times. UNSO can not always take all sources into account in their annual compilation of international data. However, improvements in the UNIDO data base are not tied to an annual publication such as the Yearbook of Industrial Statistics. Statistical work in UNIDO may consist not only of updates but revisions involving any year between 1963 to present, and this luxury permits a painstaking and extensive search of all potential national sources.

(d) The inclusion of statistics compiled through field work: Beginning in 1983, UNIDO undertook additional efforts to upgrade the quality of industrial statistics. These projects concern specific countries where data were not previously available or where the UNSO data available departed significantly from the International Recommendations for Industrial Statistics and sufficient information was not available to take account of these discrepancies. Field work is carried out by UNIDO statisticians and/or experts who are usually national statisticians already working in the country. Two field projects were carried out in 1983, two more are underway in 1984 and others are planned in future years. In addition to these projects, UNIDO is currently implementing a regional statistical project - funded by the Japanese Ministry of International Trade and Industry (MITI) - which involves the collection of detailed industrial data for 12 Asian countries and field work in five of these countries. All such projects are designed to supplement and extend the existing country statistics. Thus, the results are of immediate relevance for the data base.

Stage III - The inclusion of data from additional international sources. As indicated above, when producing the Yearbook of Industrial Statistics, vol.1, UNSO statisticians are concerned solely with two aspects: (i) the compilation of country responses to the industrial questionnaire and (ii) documentation of departures from the International Recommendations for Industrial Statistics and the ISIC. In extending the work of UNSO, UNIDO gives highest priority to the UNSO data (stage I), as supplemented by national data (stage II). However, other international institutions also compile industrial data concerning a variety of subjects and, sometimes, in considerable detail and these sources are sometimes useful in further development of the UNIDO data base.

Initially, international data sources are carefully screened by UNIDO statisticians to determine their quality, coverage, scope and definitions. Where UNIDO standards are met, the information is considered by statisticians in their work on the data base. The uses for such data may include adjustments in the available data emerging from stage II to ensure compatibility in terms of coverage, to account for departures from the ISIC, to include previously missing observations, etc.[1/] In addition, unpublished data, mainly in machine-readable form, is obtained from various institutions - the World Bank, EUROSTAT, Economic Commission for Africa, Economic Commission for Europe, ILO and FAO - and is incorporated in stage III when this is practical.

1/ Published sources which have been utilized in connection with the work at stage III include Eurostat, ACP, Statistical Yearbook; ECLA, Statistical Yearbook for Latin America; ECWA, Statistical Abstract of the Region of the Economic Commission for Western Asia; ESCAP, Statistical Yearbook for Asia and the Pacific; ILO, Yearbook of Labour Statistics; UNESCO, Statistical Yearbook; United Nations, Yearbook of National Accounts Statistics, Statistical Yearbook and The 1973 World Programme of Industrial Statistics; United Nations Office for Development Research and Policy Analysis, Handbook of World Development Statistics.

Stage IV - UNIDO estimates. Upon completion of stage III the various sources of industrial statistics, in descending order of priority, are UNSO, national publications and international sources. At this point considerable progress has been made in rectifying some of the more obvious problems which detract from the use of industrial data in international studies. However, all adjustments carried out in stages II and III have been 'cell-specific', that is, the work of statisticians has been confined to data cleaning operations for the given country, data field, industry and year for which exogenous information was available.

The most obvious way of extending the work from stages II and III - as well as the approach which requires only modest assumptions about growth and structural change - is to make use of these results to clean previously untouched data pertaining to the same industry and field in other years. Thus, information gathered in stages II and III is utilized to make further adjustments for years other than those considered in earlier stages. To date, the work in stage IV focuses on one specific problem - the practice of combined reporting (i.e. reporting an aggregate for two or more industries defined at a 3-digit level of the ISIC). After extracting further information from national and international sources, many of these combinations have been eliminated - for specific years and industries - from the original country data. Where a sufficient number of years have been cleaned, the results are then applied to remaining years in the time series 1963-81.[1/]

1/ The methods of estimation are straight-forward but vary depending on the number of observations in this time period which have previously been adjusted to the ISIC 3-digit level of specification. An extensive description of these methods, and the results, will be published in 1984.

In conclusion, upon completion of stage IV, many of the outstanding discrepancies in the original data have been eliminated. The reader should be cautioned, however, that the problems described in section B of this paper have, by no means, been completely eliminated. UNIDO's efforts to improve the quality of industrial data - in collaboration with UNSO - will continue. The data base will be updated annually but work to extend the detail and to standardize concepts and definitions will be a permanent feature of the statistical programme.

ANNEX A

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Used in Conjunction with the Unido Data Base

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ANNEX B

Classification of Industries According to the ISIC

Industry	ISIC
Food products	311
Beverages	313
Tobacco	314
Textiles	321
Wearing apparel	322
Leather and fur products	323
Footwear	324
Wood and cork products	331
Furniture and fixtures, excluding metal	332
Paper	341
Printing and publishing	342
Industrial chemicals	351
Other chemicals	352
Petroleum refineries	353
Miscellaneous products of petroleum and coal	354
Rubber products	355
Plastic products	356
Pottery, china and earthenware	361
Glass	362
Other non-metallic mineral products	369
Iron and steel	371
Non-ferrous metals	372
Metal products, excluding machinery	381
Non-electrical machinery	382
Electrical machinery	383
Transport equipment	384
Professional and scientific equipment, photographic and optical goods	385
Other manufacturing	390